

Accepted Manuscript

Hygrothermal aging effects on mechanical and fatigue behaviors of a short-natural-fiber-reinforced composite

Mahdi Mejri, Lotfi Toubal, Jean-Christophe Cuillère, Vincent François

PII: S0142-1123(17)30424-3
DOI: <https://doi.org/10.1016/j.ijfatigue.2017.11.004>
Reference: JIJF 4499

To appear in: *International Journal of Fatigue*

Received Date: 15 May 2017
Revised Date: 4 September 2017
Accepted Date: 6 November 2017

Please cite this article as: Mejri, M., Toubal, L., Cuillère, J-C., François, V., Hygrothermal aging effects on mechanical and fatigue behaviors of a short- natural-fiber-reinforced composite, *International Journal of Fatigue* (2017), doi: <https://doi.org/10.1016/j.ijfatigue.2017.11.004>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Hygrothermal aging effects on mechanical and fatigue behaviors of a short- natural-fiber-reinforced composite

Mahdi Mejri^{1,2}, Lotfi Toubal¹, Jean-Christophe Cuillière², Vincent François²

¹ Laboratory of Mechanics and Eco-Materials (LMEM), Université du Québec à Trois-Rivières, 3351 boul. Des Forges, C.P.500, G9A 5H7, Québec, Canada

² Équipe de Recherche en Intégration Cao-CALcul (ERICCA), Université du Québec à Trois-Rivières, 3351 boul. Des Forges, C.P.500, G9A 5H7, Québec, Canada

Ph.D. student: mahdi.mejri@uqtr.ca, Tel. +18193765011#3949; Professor: lotfi.toubal@uqtr.ca, Tel. +18193765011#3917; Professor: cuillier@uqtr.ca, Tel. +18193765011#3920; Professor: francois@uqtr.ca, Tel. +18193765011#3957.

* Corresponding author: Prof. Lotfi Toubal (lotfi.toubal@uqtr.ca)

ABSTRACT

A new natural fiber composite made of high density polyethylene (HDPE) and 40%wt short birch fibers (SBF) was developed to replace polyamide (better known under its industrial name “Nylon”) in spur gear manufacturing. The effect of hygrothermal aging on quasi-static and fatigue bending behaviors of this new composite has been studied in this work. Once hygrothermal aging is completed, flexural quasi-static tests have been performed on aged specimens and results compared with those obtained from unaged specimens. It has been observed that hygrothermal aging has no significant effect on flexural mechanical properties of this composite. After characterization, bending fatigue tests have been conducted on aged specimens and results have been compared with those of unaged specimens. These fatigue tests show that hygrothermal aging decreases the high cycles fatigue strength (HCFS) of this composite. The cause of this fatigue durability decrease has been investigated using Fourier transform infrared spectroscopy (FT-IR), thermogravimetric analysis (TGA) and a scanning electron microscope (SEM). These tests show that the chemical composition and thermal behavior of this composite are not affected by hygrothermal aging. On the contrary, these tests show that damage mechanisms of this composite (HDPE/40%wt of SBF) are directly affected by this type of aging.

Keywords: hygrothermal aging, fatigue durability, residual strength, damage mechanisms, natural fiber composite

Download English Version:

<https://daneshyari.com/en/article/7171607>

Download Persian Version:

<https://daneshyari.com/article/7171607>

[Daneshyari.com](https://daneshyari.com)